Philips Medical Systems
DICOM Conformance Statement

EasyVision RAD R4.2 Level 4

Document Number 4522 170 01182
23 May 2003

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1 Introduction

This section provides general information about the scope, intended audience and contents of this Conformance Statement and how to use it.

1.1 Scope and field of application

The scope of this DICOM Conformance Statement is to facilitate data exchange between equipment of Philips Medical Systems and with equipment of other vendors. This document specifies the compliance to the DICOM standard, formally called the NEMA PS 3.X standards. It contains a short description of the applications involved and provides technical information about the data exchange capabilities of the equipment. The main elements describing these capabilities are: the supported DICOM Service Object Pair (SOP) Classes, Roles, Information Object Definitions (IOD), Service Elements and Transfer Syntaxes.

The field of application is the integration of the Philips Medical Systems equipment into an environment of medical devices.
This Conformance Statement should be read in conjunction with the DICOM standard and its addenda. The conformance to the DICOM standard is a key element of the Inturis Program (see [INTURIS]).

1.2 Intended audience

This Conformance Statement is intended for:
- (potential) clients,
- marketing staff interested in data exchange functionality,
- system integrators and Customer Support Engineers of medical equipment,
- software engineers implementing DICOM interfaces.

It is assumed that the reader is familiar with the DICOM standard.

1.3 Contents and structure

The DICOM Conformance Statement is contained in section 2 through 7 and follows the contents and structuring requirements of DICOM PS 3.2.
Additionally, the sections following 7 (if present) specify the details of the applied IODs and Service Elements.

1.4 Used definitions, terms and abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3.
The word Philips in this document refers to Philips Medical Systems.

1.5 References

[DICOM] The Digital Imaging and Communications in Medicine (DICOM) standard:
NEMA PS 3.X (X refers to the part 1 - 13)
National Electrical Manufacturers Association (NEMA) Publication Sales
1300 N. 17th Street, Suite 1847
Rosslyn, Va. 22209, United States of America

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1.6 Important note to the reader

This Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- Interoperability
  Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into a networked environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment. It is the user's responsibility to analyse thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

- Validation
  Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.
  Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

- New versions of the DICOM Standard
  The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery.
  The user should ensure that any non-Philips provider linking to Philips equipment, also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

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1.7 Acronyms and Abbreviations.

The following acronyms and abbreviations are used in the document.

- ACC American College of Cardiology
- AE Application Entity
- ACR American College of Radiology
- ANSI American National Standard Institute
- BOT Basic Offset Table
- CD-R CD Recordable
- CD-M CD Medical
- DCI Digital Cardio Imaging
- DCR Dynamic Cardio Review
- DICOM Digital Imaging and Communication in Medicine
- DIMSE DICOM Message Service Element
- DIMSE-C DICOM Message Service Element-Composite
- DIMSE-N DICOM Message Service Element-Normalized
- ELE Explicit VR Little Endian
- EBE Explicit VR Big Endian
- EV EasyVision
- FSC File Set Creator
- GUI Graphic User Interface
- HIS Hospital Information System
- HL7 Health Level Seven
- ILE Implicit VR Little Endian
- IOD Information Object Definition
- ISIS Information System - Imaging System
- NEMA National Electrical Manufacturers Association
- PACS Picture ArChiving System
- PDU Protocol Data Unit
- RIS Radiology Information System
- RWA Real World Activity
- SC Secondary Capture
- SCM Study Component Management
- SCP Service Class Provider
- SCU Service Class User
- SOP Service Object Pair
- TCP/IP Transmission Control Protocol/Internet protocol
- UID Unique Identifier
- WLM Worklist Management

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2 Implementation model

This DICOM Conformance Statement specifies the DICOM behaviour of the PCR system of Philips Medical System. The EasyVision Rad 4.2 (short EasyVision or EV) is an essential part of PCR.

PCR is able to generate Computed Radiography (CR) images. These images can be exported as DICOM CR images via EasyVision RAD R4.2. Therefore, this document will specify the DICOM behaviour of EasyVision RAD R4.2.

EasyVision RAD R4.2 is a medical imaging workstation application. It provides the following features:

- The application receives images sent to it by remote applications (e.g. workstations or imaging modalities) and stores them in a local database.
- The application allows the operator to copy images from the local database to remote databases and vice versa. For this purpose the operator is allowed to query remote databases.
- The application allows a remote system to query the EasyVision local database and to retrieve images from it.
- The application allows the operator, among other things, to view, to analyse, to process and to print the images stored in the local database.
- It allows the operator to print images stored in the database on a DICOM printer.
- It is able to read and write DICOM CD-R disks.

The remote database access and image transfer functions are implemented using the DICOM Query/Retrieve and Storage services.

The viewing, analysis, processing and printing functions are primarily designed for images generated by Philips equipment and that are sent to the EasyVision by means of PMSNet, the Philips Medical Systems proprietary communication protocol. Some of these functions may not perform optimally when applied to images that are sent to EasyVision by means of DICOM. For example, viewing and printing of curves and colour images are not supported. However the main image source for the PCR system is the CR-Reader which is connected over a propriety protocol.

2.1 Application Data Flow Diagram

The EasyVision system behaves as a single application entity. The related Implementation Model is shown in Figure 2-1 on page 6.

The EasyVision operator can request to query a selected remote system, request to copy images from EasyVision to a selected remote system, request to retrieve selected images from remote systems and can request to print images. This results in Associations initiated by EasyVision.
EasyVision is able to reply on verification requests, to execute a requested query, to store received images into EasyVision and retrieve requested images from EasyVision. These requests from remote systems are done via Associations initiated by the remote systems.

EasyVision is also able to display the contents (i.e. directory listing) of DICOM CD-Recordable disks and to write, read and update images on/from a DICOM CD-Recordable disk.

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2.2 Functional definition of Application Entities

The EasyVision application entity acts as a service class user of Query/Retrieve and Storage service classes. The application acts as a service class provider of Verification, Query/Retrieve and Storage service classes.

The EV-Print Application Entity acts as Service Class User (SCU) for the Print Service Class.

EasyVision acts also as a File Set Creator (FSC), File Set Reader (FSR) and File Set Updater (FSU) of the Media Service Class.

2.3 Sequencing of Real World Activities

All Real-World Activities as specified in Figure 2-1 may occur independently from each other, except that the two local Print Real-World Activities are mutual exclusive: A request for the printer status is not done when a request for image printing is busy, vice versa.

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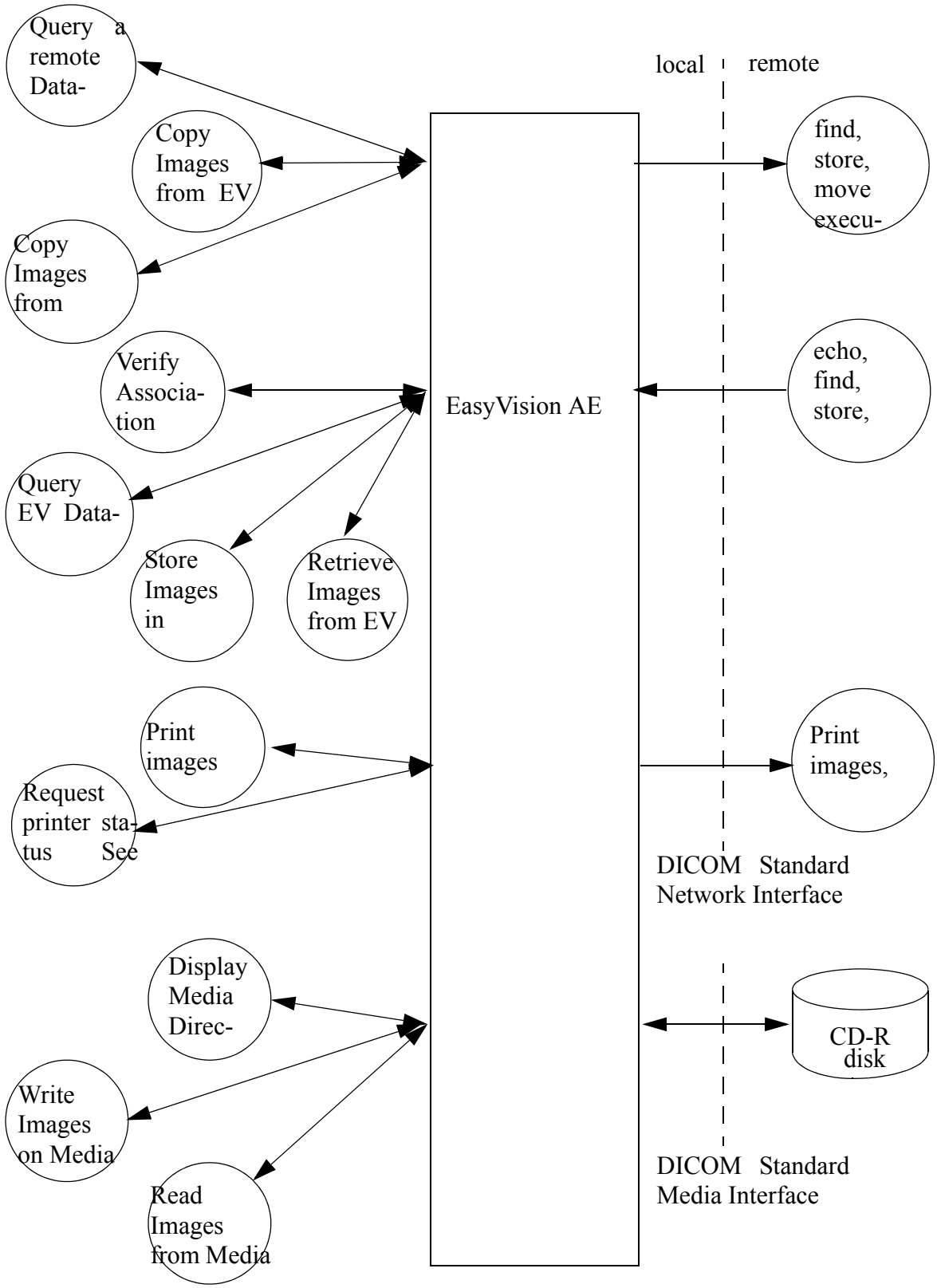
Figure 2-1: EasyVision (EV) Implementation Model



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3 AE Specifications

3.1 AE EasyVision Specification

The EasyVision Application Entity provides Standard Conformance to the following DICOM V3.0 SOP classes as an SCU:

Table 3-1: Supported SOP classes by the EasyVision AE as SCU[a]

SOP class Name	*UID*
Patient Root Query/Retrieve Info Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Study Root Query/Retrieve Info Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Patient/Study Only Query/Retrieve Info Model - FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient Root Query/Retrieve Info Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Info Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Patient/Study Only Query/Retrieve Info Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2
CR Image Storage - STORE	1.2.840.10008.5.1.4.1.1.1
CT Image Storage - STORE	1.2.840.10008.5.1.4.1.1.2
MR Image Storage - STORE	1.2.840.10008.5.1.4.1.1.4
NM Image Storage - STORE	1.2.840.10008.5.1.4.1.1.5
US Image Storage - STORE (old)	1.2.840.10008.5.1.4.1.1.6
SC Image Storage - STORE	1.2.840.10008.5.1.4.1.1.7
XA Single-Plane Image Storage - STORE	1.2.840.10008.5.1.4.1.1.12.1
RF Image Storage - STORE	1.2.840.10008.5.1.4.1.1.12.2
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
>[b] Basic Film Session SOP Class	1.2.840.10008.5.1.1.1
> Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
> Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1
> Printer SOP Class	1.2.840.10008.5.1.1.16
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
>[c] Basic Film Session SOP Class	1.2.840.10008.5.1.1.1
> Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
> Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4
> Printer SOP Class	1.2.840.10008.5.1.1.16

a. In case the remote system does not support one of these Image SOP Classes but does support the SC Image Storage, EasyVision is able to convert these images and sends them via the SC Image SOP Class. This behaviour is configurable.

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b. The '>' sign indicates that the SOP Class is part of the above mentioned Meta SOP Class.
c. The '>' sign indicates that the SOP Class is part of the above mentioned Meta SOP Class.

The EasyVision Application Entity provides Standard Conformance to the following DICOM V3.0 SOP classes as an SCP:

Table 3-2: Supported SOP classes by the EasyVision AE as SCP

SOP class Name	*UID*
Patient Root Query/Retrieve Info Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Study Root Query/Retrieve Info Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Patient/Study Only Query/Retrieve Info Model - FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient Root Query/Retrieve Info Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Info Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Patient/Study Only Query/Retrieve Info Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2
CR Image Storage - STORE	1.2.840.10008.5.1.4.1.1.1
CT Image Storage - STORE	1.2.840.10008.5.1.4.1.1.2
US Multi Frame Image Storage - STORE (old)	1.2.840.10008.5.1.4.1.1.3
MR Image Storage - STORE	1.2.840.10008.5.1.4.1.1.4
NM Image Storage - STORE	1.2.840.10008.5.1.4.1.1.5
US Image Storage - STORE (old)	1.2.840.10008.5.1.4.1.1.6
SC Image Storage - STORE	1.2.840.10008.5.1.4.1.1.7
XA Single-Plane Image Storage - STORE	1.2.840.10008.5.1.4.1.1.12.1
RF Image Storage - STORE	1.2.840.10008.5.1.4.1.1.12.2
XA Bi-Plane Image Storage - STORE	1.2.840.10008.5.1.4.1.1.12.3
Verification	1.2.840.10008.1.1

3.1.1 Association Establishment Policies

3.1.1.1 General

EasyVision will offer an unrestricted PDU size (i.e. equal to 0) on associations initiated by EasyVision itself. The applied maximum PDU size for these associations is configurable per node. EasyVision will accept PDU sizes up to this configured maximum on associations initiated by remote applications.

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3.1.1.2 Number of Associations

The number of simultaneous associations supported by EasyVision as a service class provider is in principle not limited. The practical maximum number of supported associations is determined by the amount of resources (CPU, memory, hard disk size).
As a result of local activities, EasyVision will initiate at most 2 simultaneous associations. One association is used to issue find requests. The other association is used to issue store and move requests.
EasyVision will further initiate an association for each remote move request executed by EasyVision as a move service class provider. These associations are used to issue the store suboperations implied by the move requests. The number of simultaneous store associations is in principle not limited.

3.1.1.3 Asynchronous Nature

EasyVision does not support asynchronous operations and will not perform asynchronous window negotiation.

3.1.1.4 Implementation Identifying Information

The Implementation Class UID is: 1.3.46.670589.5.2.11
The implementation version name is: EV42

3.1.2 Association Initiation Policy

EasyVision initiates associations as a result of the following events:
- The EasyVision operator queries a remote database.
- The EasyVision operator or a remote application copies images from the EasyVision database to another database.
- The EasyVision operator copies images from a remote database to another database.

3.1.2.1 Query a Remote Database

3.1.2.1.1 Associated Real-World Activity

The operator queries a remote database by means of the query tool in the EasyVision data handling facility. EasyVision initiates an association to the selected peer entity and uses it to send C-FIND requests (and receive the associated find replies). The association is released when the find execution completes.

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3.1.2.1.2 Proposed Presentation Contexts

EasyVision will propose the following presentation contexts:

Table 3-3: Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
See Note	See Note	ILE	1.2.840.10008.1.2	SCU	None
See Note	See Note	ELE	1.2.840.10008.1.2.1	SCU	None
See Note	See Note	EBE	1.2.840.10008.1.2.2	SCU	None
See Note	See Note	JPEG Lossless, Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70	SCU	None

Note: Any of the FIND SOP classes listed in Table 3-1, “Supported SOP classes by the EasyVision AE as SCU,” on page 7.

3.1.2.1.3 C-FIND SCU Conformance

EasyVision will not generate queries containing optional keys. EasyVision will not generate relational queries.

3.1.2.2 Copy Images from the EasyVision Database to another Database

3.1.2.2.1 Associated Real-World Activity

The operator copies a (part of a) study from the local EasyVision database to a another database by means of the copy tool in the EasyVision data handling facility. EasyVision initiates for each selected study an association to the selected peer entity and uses it to send C-STORE requests (and receive the associated store replies). The association is released when all selected images in the selected study have been transmitted. EasyVision handles operator copy requests one after another.
A remote application copies images from the local EasyVision database to a another database by sending a C-MOVE request to EasyVision. EasyVision initiates for each received move request an association to the requested move destination and uses it to send C-STORE requests (and receive the associated store replies). The association is released when all images selected by the move request identifier have been transmitted. EasyVision simultaneously handles C-MOVE requests.

3.1.2.2.2 Proposed Presentation Contexts

EasyVision will propose the following presentation contexts, see Table 3-3 on page 10

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3.1.2.2.3 C-STORE SCU Conformance

EasyVision will stop the transfer of the images and release the association as soon as it receives an unsuccessful or warning store response status. If the EasyVision operator requested the transfer, the store response status is displayed via the user interface of EasyVision. If a remote application requested the transfer (by means of a C-MOVE request), a move response with status unsuccessful is sent to the move requester.
Extended negotiation is not supported.

In case the remote system does not support images of the Image Storage SOP Classes of Table 3-1 on page 7, EasyVision will convert these images and sends them via the SC Image SOP Class (if this SOP Class is supported by the remote station). Information will be lost with this SOP Class conversion.
The transmitted Storage SOP instances may include all **optional data elements** specified in the standard and its supplements 4 and 6. The presence of optional data elements is dependent of the origin of images exported by EasyVision RAD. When CR images originates from the Philips PCR R5.3 system the existence of optional data elements is well defined and is specified in detail in 8 on page 25.

The transmitted Storage SOP instances may contain (depending on the EasyVision configuration) **retired and private data elements** dependent of the source of the images. These Retired and Private elements are not described here except for the following elements that facilitate the correct interpretation of the pixel data of images exported by EasyVision:

- *Owner Data Elements: (odd group number, 00YY), VR=LO, VM=1*
  These are the private Creator data elements. The value of this text element is ‘SPI-P Release 1’ or ‘SPI-P-PCR Release 2’. It declares that all elements YYxx in the shadow groups are private Philips elements.
- *Image Data Consistency: (0009, YY04), VR=LO, VM=n*
  This element indicates that the consistency of some data elements may be limited because of incorporated processing, windowing or burnt in graphics. A data element becomes inconsistent if its value incorporates a value (or reference to a value) which has been changed while the data element itself has not been changed or deleted. Updating or deleting such data elements cannot be done if the data element is a free formatted data element or other than a standard data element. The generic format of this text element is: <free text> | ‘$’<enumerated text>. The following enumerations are defined for the first value:
  - ‘unknown’. This is the default value.
  - ‘normal’. Normal consistency.
  - ‘limited’. Possibly limited consistency.
- *Original Pixel Data Quality: (0019,YY25), VR=LO, VM= n*
  If an image is calibrated with respect to the pixel size in the patient, this element contains the text: “$calibrated”.

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3.1.2.3 Copy Images from a Remote Database to another Database

3.1.2.3.1 Associated Real-World Activity

The operator copies a (part of a) study from a remote database to another, local or remote, database by means of the copy tool in the EasyVision data handling facility. EasyVision initiates for each selected study an association to the selected peer entity and uses it to send C-MOVE requests (and receive the associated move replies). The association is released when all selected images in the selected study have been transmitted.

3.1.2.3.2 Proposed Presentation Contexts

EasyVision will propose the presentation contexts, see Table 3-3 on page 10

3.1.2.3.3 C-MOVE SCU Conformance

The AE provides standard conformance.

3.1.2.4 Print images

3.1.2.4.1 Associated Real-World Activity

There are two ways to request for image printing:

- Print Compose
  The operator is able to select one or more images from the internal database (via the Data Handling facility) and perform the Print operation on them.
- Print Protocol
  The operator is also able to print images via the various clinical applications of EasyVision.

The operator will select the print destination (out of choice list of configured printers) and some print parameters (depending on the configuration and the selected printer).
As a result, EasyVision will initiate an association to the selected printer and uses it to send the Print Service Elements of the Print SOP Classes.

EasyVision allows to have a print preview first.

3.1.2.4.2 Proposed Presentation Contexts

EasyVision will propose the presentation contexts as given in: Table 3-3.

3.1.2.4.3 Conformance to the Print SOP Classes

EasyVision provides standard conformance to the Basic Grayscale Print Management Meta SOP Class.

The applied order of Print Service Elements (DIMSE's) is specified in Table 3-4. A description and the applied optional (i.e. non-mandatory attributes as Print SCU) attributes in these Service Elements are specified too. Note that the Service Elements order is not specified by the DICOM standard.

An explicit N-DELETE Request on the created instances is not done by EasyVision; these are deleted implicitly when releasing the association.

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Overlay, Annotation (showing the values of some major identifying attributes) and Shutter information is processed in the images sent to the printer (i.e. burnt-in in the image).

The **full list of (Mandatory and Optional) attributes** applied in these Service Elements are given in 8 on page 25.

Table 3-4: The applied order of Print Service Elements and its optional attributes

Service Element of SOP Class	*Description and applied optional attributes*
N-GET of the Printer SOP Class	Purpose is to retrieve printer information.
N-CREATE of the Basic Film Session SOP Class	EasyVision specifies the DICOM Printer about some general presentation parameters, applicable for all films in the Film Session. Applied optional attributes are: Number of Copies, Print Priority, Medium Type, Film Destination
N-CREATE of the Basic Film Box SOP Class	EasyVision specifies the DICOM Printer about some general presentation parameters, applicable for all images in the Film Box. Applied optional attributes are: Film Orientation, Film Size ID, Magnification Type, Max. Density, Configuration Information, Trim.
N-SET of the Basic Grayscale/ Color Image Box SOP Class	EasyVision will send the images to be printed. Applied optional attributes are: Polarity
N-ACTION of the Basic Film Box SOP Class	EasyVision triggers the DICOM Printer to print, this actual print action is done at film box level. No (optional) attributes are present.

The table below specifies the supported Service Elements which may be generated by the Printer at any time during the association.

Table 3-5: The applied sequence of Print Service Elements and its optional attributes

Service Element of SOP Class	*Note*
N-EVENT-REPORT of the Printer SOP Class	May be sent at any moment by the Printer SCP (i.e. the DICOM Printer). EasyVision will ignore the contents of these events. However, the printer status is polled via a separate association, see section See 3.1.2.5.

The Status Codes of DIMSE Responses (Success, Warning, Failure) as returned by the printer will also be logged (for service purposes) and are mapped onto general print job status messages towards the operator. These User Interface messages indicate:

- “Job Completed” and has the meaning that the print job is accepted by the printer; the actual printing will be done afterwards.
- “General Print Error” indicating that a failure occurred during the DICOM Print. Also, most warning cases (like default printer values applied on optional print attributes) are interpreted as a print error because this will mostly result in a different print quality or print lay-

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out than expected.

The following implementation remarks are important to achieve successful printing:

- The number of Film Boxes per Film Session is **one**.
- The number of images per Film Box is **one**.
  The images to be printed on one film are rendered by EasyVision into one logical image. This logical image is very large, depending on the pixel matrix size (pixels per line, lines per image), use of color or not. A rough indication is 20 MByte. One should take this into account when selecting the DICOM printer and the printer configuration (e.g. the amount of memory).
- EasyVision will release the association when the print command is given (i.e. the N-ACTION Request); the association is not kept open for receiving N-EVENT-REPORTs of the Printer SOP Class.
- On status-errors/warnings in a DIMSE response, the data transfer will be stopped and film will not be printed.

3.1.2.5 Request for the printer status

3.1.2.5.1 Associated Real-World Activity

EasyVision will periodically (every 10 seconds) request for the printer status. This is only done when no association is set-up for a print job. In case of a print job association the printer status is requested in that association.
The received printer status is displayed in the Printer Status Tool.

3.1.2.5.2 Proposed Presentation Contexts

EasyVision will propose the presentation contexts as given in: Table 3-3.

3.1.2.5.3 Conformance to the Printer SOP Class

EasyVision provides standard conformance to this SOP Class.
The applied optional attributes in the N-GET Service Element are specified in Table 3-6. The **detailed list of (Mandatory and Optional) attributes** applied in this Service Element is given in 8 on page 25.

Table 3-6: The applied optional attributes in the N-GET Service Element

Service Element of SOP Class	*Note*
N-GET of the Printer SOP Class	Purpose is to retrieve printer information. Applied optional attributes are: Printer Status, Printer Status Info, Printer Name, Manufacturer, Manufacturer Model Name

The Status Codes of Printer N-GET Responses (Success, Warning, Failure) as returned by the printer will also be logged (for service purposes) and are not indicated towards the operator.

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3.1.3 Association Acceptance Policy

The EasyVision Application Entity rejects association requests from unknown applications, i.e. applications that offer an unknown “calling AE title”. An application is known if and only if it is defined during configuration of the EasyVision system.
The EasyVision Application Entity rejects association requests from applications that do not address the EasyVision AE, i.e. that offer a wrong “called AE title”. The EasyVision AE title is defined during configuration of the EasyVision system.
EasyVision accepts associations for the following purposes:

- To allow remote applications to verify application level communication with EasyVision.
- To allow remote applications to query the EasyVision database.
- To allow remote applications to store images in the EasyVision database.
- To allow remote applications to retrieve images from the EasyVision database.

Any of the presentation contexts shown in Table 3-3 on page 10 are acceptable.

3.1.3.1 Verify Application Level Communication

3.1.3.1.1 Associated Real-World Activity

EasyVision accepts associations from nodes that wish to verify application level communication using the C-ECHO command.

3.1.3.1.2 Presentation Context Table

Any of the presentation contexts shown in Table 3-3 on page 10 are acceptable.

3.1.3.1.3 C-ECHO SCP Conformance

EasyVision provides standard conformance.

3.1.3.1.4 Presentation Context Acceptance Criterion

EasyVision accepts all contexts in the intersection of the proposed and acceptable presentation contexts. There is no check for duplicate contexts. Duplicate contexts are accepted.

3.1.3.1.5 Transfer Syntax Selection Policies

EasyVision prefers Explicit VR Big Endian above Explicit VR Little Endian above JPEG Lossless above Implicit VR Little Endian transfer syntax.

3.1.3.2 Query the EasyVision Database

3.1.3.2.1 Associated Real-World Activity

EasyVision accepts associations from nodes that wish to query the EasyVision database using the C-FIND command.

3.1.3.2.2 Presentation Context Table

Any of the presentation contexts shown in Table 3-3 on page 10 are acceptable.

3.1.3.2.3 C-FIND SCP Conformance

EasyVision provides standard conformance. Optional keys are not supported. Relational queries are not supported. EasyVision simultaneously handles simultaneous C-FIND requests.

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3.1.3.2.4 Presentation Context Acceptance Criterion

See 3.1.3.1.4 on page 15.

3.1.3.2.5 Transfer Syntax Selection Policies

See 3.1.3.1.5 on page 15.

3.1.3.3 Store Images in the EasyVision Database

3.1.3.3.1 Associated Real-World Activity

EasyVision accepts associations from nodes that wish to store images in the EasyVision database using the C-STORE command.

3.1.3.3.2 Presentation Context Table

Any of the presentation contexts shown in Table 3-3 on page 10 are acceptable.

3.1.3.3.3 C-STORE SCP Conformance

EasyVision provides level 2 (Full) conformance for the Storage Service Class. In the event of a successful C-STORE operation, the image has been stored in the EasyVision database. The duration of the storage of the image is determined by the operator of the EasyVision system.

The EasyVision storage implementation has the following restrictions:
- Although EasyVision does accept colour images, it does not properly support storage and retrieval of such images.
- EasyVision stores XA Bi-Plane as two Single Plane images.
- EasyVision stores multi-frame images as a series of single frame images.
- EasyVision rejects images with High Bit not equal to Bits Stored - 1.

EasyVision does not modify the pixel values of the stored images but it allows the operator to modify attributes of the received and stored images. Modified images retain their original study, series and image UID. Remote applications may access the stored (and possibly modified) images using C-FIND and/or C-MOVE operations.

The received and stored images can be input for a number of EasyVision applications. The viewing of stored images is possible when all Mandatory DICOM attributes are present in the images of the supported SOP Classes as SCP (see table Table 3-2 on page 8). Advanced applications mostly rely on the existence of Philips Private attributes which is not specified in this Statement.

EasyVision stores all private data elements it receives. These elements can only be retrieved (by means of a C-MOVE request) if the following condition is satisfied:
- The image was encoded (when EasyVision was C-STORE SCP) using one of the explicit value representations or
- The image was encoded (when EasyVision was C-STORE SCP) using implicit value representation and the move destination (i.e. a C-STORE SCP) has accepted implicit value representation as the only transfer syntax applicable to the storage SOP class of the image (when EasyVision is C-STORE SCU).

The C-STORE is unsuccessful if EasyVision returns one of the following status codes:

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- A700 - Indicates the database is full. Recovery from this condition is left to the service class user.
- A900 - Indicates that the SOP class of the image does not match the abstract syntax negotiated for the presentation context.
- C000 - Indicates that the image cannot be parsed.

3.1.3.3.4 Presentation Context Acceptance Criterion

See 3.1.3.1.4 on page 15.

3.1.3.3.5 Transfer Syntax Selection Policies

See 3.1.3.1.5 on page 15.

3.1.3.4 Retrieve Images from the EasyVision Database

3.1.3.4.1 Associated Real-World Activity

EasyVision accepts associations from nodes that wish to retrieve images from the EasyVision database using the C-MOVE command.

3.1.3.4.2 Presentation Context Table

Any of the presentation contexts shown in Table 3-3 on page 10 are acceptable.

3.1.3.4.3 C-MOVE SCP Conformance

EasyVision supports all the Storage SOP classes listed in Table 3-2, “Supported SOP classes by the EasyVision AE as SCP,” on page 8.

3.1.3.4.4 Presentation Context Acceptance Criterion

See 3.1.3.1.4 on page 15.

3.1.3.4.5 Transfer Syntax Selection Policies

See 3.1.3.1.5 on page 15.

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3.2 EasyVision AE Media Specification

The EasyVision AE provides Standard Conformance to the DICOM Media Storage Service and File Format (PS 3.10) and the Media Storage Application Profiles (PS 3.11) as far as the reading of uncompressed images on CD-Recordable medium is concerned.
EasyVision supports **multi-patient** and **multi-session** (both for reading and writing) CD-R disks.
Additionally, the reading of CD-Medical Basic Cardiac disks is supported (non private DICOM only), the writing of this type of disks is not supported.

The supported Application Profiles, their Roles and the Service Class (SC) options, all defined in DICOM terminology, are listed in Table 3-7.

Table 3-7: Application Profile, Activities and Roles of the DICOM Media part of EasyVision

Application Profile	*Identifier*	*Real World Activity*	*Role*	*SC Option*
General Purpose CD-R Image Interchange Profile	STD-GEN-CD	Display Directory of CD-R disk	FSR	Interchange
	STD-GEN-CD	Write image(s) on CD-R disk	FSC	Interchange
	STD-GEN-CD	Read image(s) from CD-R disk	FSR	Interchange

The same SOP Classes are supported as mentioned in Table 3-1 on page 7 (for Write) and Table 3-2 on page 8 (for Read) via this Application Profile.

3.2.1 File Meta Information

The Application Entity Title can be configured. The Implementation Class UID and the Implementation Version Name in the File Meta Header is specified in 3.1.1.4 on page 9.

3.2.2 Media related Real-World Activities

3.2.2.1 RWA Display Directory

The EasyVision AE will act as a FSR when reading the directory of the medium. This will result in an overview of the patients, studies, series and images on the EasyVision screen.

Implementation restriction:
- EasyVision is not guaranteed able to display the directory listing of CD-ROM disks on which the data is pressed by the disk producer (like is the case with software CD's).

3.2.2.1.1 Application Profile(s) for this RWA

See Table 3-7.

3.2.2.1.2 Required and optionally DICOMDIR Keys

The Mandatory DICOMDIR Keys are required for the correct display of Directory information. The display is structured according the DICOM Composite Information Model: Patient, Study, Series, Image.

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Possibly present optional DICOMDIR Keys are not displayed.

3.2.2.2 RWA Write images on CD-R disk

The EasyVision AE will act as a FSC when writing all/selected images in a patient folder onto the CD-R medium.
Note that the images are written in ELE (by default), so are uncompressed, as specified in the STD-GEN-CD Application Profile. Other Presentation contexts are configurable.

3.2.2.2.1 Application Profile(s) for this RWA

See Table 3-7.

3.2.2.2.2 Support for Attributes in the images

The same remarks as in 3.1.2.2 on page 10 about the existence of Optional, Retired and Private Attributes are applicable.
The DICOMDIR file will be extended when new images are written. In case some attributes are not present in the images but are specified Mandatory in the DICOMDIR definition in DICOM Media, a dummy ID will be filled in.

Implementation remarks and restriction:
- When writing the DICOMDIR records the following key values are generated when no value of the corresponding attribute is supplied:
  - PATIENT_ID
  - STUDY_ID
  - STUDY_INSTANCE_UID
  - SERIES_NUMBER
  - SERIES_INSTANCE_UID
  - IMAGE_NUMBER
  - SOP_INSTANCE_UID
- The mechanism of generating a value for PATIENT_ID creates each time a new value based on PATIENT_NAME for each new study written to the CD-R, even if this study belongs to a patient recorded earlier.
- The default value for the Pixel Intensity Relationship (0028,1040) is set to DISP.
- A number of attributes (e.g., Window Width and Window Center) can be formatted as floating point numbers.

3.2.2.3 RWA Read images from CD-R disk

The EasyVision AE will act as a FSR when reading all/selected images from the CD-R medium.
Implementation remarks and restriction:
- EasyVision is also able to read images coded in all of the JPEG codes as specified in Table 3-3, “Proposed Presentation Contexts,” on page 10.
- For the CD-Medical medium only the standard XA STILL file are being read, the non standard XA MOVIE files are not accessible.
- When loading images from CD-R to EV-RAD the File Meta Information is copied too.

3.2.2.3.1 Application Profile(s) for this RWA

See Table 3-7.

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3.2.2.3.2 Support for Attributes in the images

The Mandatory Attributes of the DICOM images are required for the correct storage of the images in the EasyVision internal image database. If present, Optional Attributes and Retired/ Private Attributes are stored too; this is equivalent with the Level 2 (Full) conformance for the Storage Service Class in the Network support, see 3.1.3.3 on page 16.

The same remarks as in 3.1.3.3.3 on page 16 about the storage of read multi-frame/Bi-plane images and about requirements to process read images via the dedicated EasyVision application functions, are applicable.

3.2.3 Augmented Application Profile

EasyVision supports all transfer syntaxes as mentioned Table 3-3 on page 10.

Instances of the Private SOP Classes (see Table 3-1 on page 7) may be written on the CD-R disk.

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4 Communication Profiles

4.1 Supported Communication Stacks

The EasyVision application provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.2 TCP/IP Stack

EasyVision inherits its TCP/IP stack from the SUN Solaris system upon which it executes.

4.2.1 Physical Media Support

Ethernet ISO 8802-3. Standard twisted pair 10-BaseT or 100-BaseT (self-sensing)

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5 Extensions/Specializations/Privatizations

The supported Image Storage SOP Classes may be extended. This means that the exported images may contain additional Standard and Private attributes, depending on the origin of the images.
For additional descriptions see 3.1.2.2.3 on page 11 and 8 on page 25.

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6 Configuration

The EasyVision system is configured by means of a configuration program. This program is accessible at start-up of the EasyVision system. It is password protected and intended to be used by Philips service engineers only. The program prompts the service engineer to enter configuration information needed by the EasyVision application.

6.1 AE Title/Presentation Address mapping

6.1.1 Local AE Titles and Presentation Addresses

The EasyVision AE title is equal to the IP host name. This host name is to be entered by the service engineer at EasyVision configuration time.
EasyVision listens on port **3010**. This port number is **not** configurable.

6.1.2 Remote AE Titles and Presentation Addresses

All remote applications that wish to communicate with EasyVision must be defined at EasyVision configuration time. The service engineer must provide the following information for each remote application:

- The application entity title.

For remote applications that act as service class provider the following additional information must be provided:

- The host name on which the application resides.
- The port number at which the application accepts association requests.
- The SOP classes for which the application provides conformance as an SCP.

6.2 Configurable parameters

The following items are also configurable:

- automatic conversion of images of SOP classes not supported by remote stations into SC Image Storage SOP instances,
- the maximum PDU size per node,
- export of private (and retired DICOM if present) attributes or not,
- either burn in re-orientation and zoom or export the annotations.

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7 Support of Extended Character Sets

EasyVision supports Extended Character Set “ISO_IR 100” which is the Latin alphabet No 1, supplementary set.

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8 Specification of exported CR Images

This chapter specifies in detail the applied attributes in the CR images from Philips EasyVision RAD R4.2.

The modules selected from the CR Image IOD module table of DICOM 3.0 are given in the table below.

Table 8-1: Applied Modules in the CR Image IOD

Information Entity	*Module*	*Note*
Patient	Patient	
	Patient Study	
Visit	Visit Status	Additional module
Study	General Study	
Series	General Series	
	CR Series	
Equipment	General Equipment	
Image	General Image	
	Image Pixel	
	Contrast/Bolus	Conditional
	CR Image	
	Overlay Plane	Additional, only when overlay is present
	X-Ray Acquisition	Additional module
	Display Shutter	Additional module, only present if shutter is used
	SOP Common	
	EasyVision RAD Private Extensions	Present if configured

The details of these applied modules are given in the tables below. The list of possible values are given (if applicable). The situation that an attribute is present conditionally/optionally or that an attribute may contain a zero length value, is indicated too. Conditions and Defined/Enumerated Values of DICOM 3.0 are applicable but are not shown in the tables.

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Table 8-2: Computed Radiography Image Storage SOP Class - Patient Module

Attribute Name	*Tag*	*Note*
Patient's Name	0010,0010	Empty if not entered by operator or sent by RIS.
Patient ID	0010,0020	Always filled
Patient's Birth Date	0010,0030	Empty if not entered by operator or sent by RIS.
Patient's Sex	0010,0040	Always filled

Table 8-3: Computed Radiography Image Storage SOP Class - Patient Study Module

Attribute Name	*Tag*	*Note*
Admitting Diagnosis Description	0008,1080	Only present if sent by RIS

Table 8-4: Computed Radiography Image Storage SOP Class - General Study Module

Attribute Name	*Tag*	*Note*
Study Date	0008,0020	Always filled
Study Time	0008,0030	Always filled
Accession Number	0008,0050	Empty if not entered by the operator or sent by RIS
Referring Physician's Name	0008,0090	Empty if not sent by RIS
Study Description	0008,1030	Always filled
Study Instance UID	0020,000D	Created by EV if not sent by RIS
Study ID	0020,0010	Always filled

Table 8-5: Computed Radiography Image Storage SOP Class - General Series Module

Attribute Name	*Tag*	*Note*
Modality	0008,0060	Applied value(s): CR
Patient Position	0018,5100	Always empty

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Table 8-5: Computed Radiography Image Storage SOP Class - General Series Module (Continued)

Attribute Name	*Tag*	*Note*
Series Instance UID	0020,000E	Created by EV
Series Number	0020,0011	Always filled
Laterality	0020,0060	

Table 8-6: Computed Radiography Image Storage SOP Class - CR Series Module

Attribute Name	*Tag*	*Note*
Body Part Examined	0018,0015	The following terms will be used for a system with the AC 500/AC 5000 Reader, and body parts not included in the DICOM's defined terms will be added. SKULL, CSPINE, TSPINE, LSPINE, SSPINE, COCCYX, CHEST, CLAVICLE, BREAST, ABDOMEN, PELVIS, HIP, SHOULDER, ELBOW, KNEE, ANKLE, HAND, FOOT, EXTREMITY, HEAD, HEART, NECK, LEG, ARM, JAW.
View Position	0018,5101	

Table 8-7: Computed Radiography Image Storage SOP Class - General Equipment Module

Attribute Name	*Tag*	*Note*
Manufacturer	0008,0070	Applied value(s): Philips Medical Systems
Institution Name	0008,0080	Always filled
Station Name	0008,1010	Always filled
Institutional Department Name	0008,1040	Always filled
Manufacturer's Model Name	0008,1090	In format “5000”
Software Version(s)	0018,1020	In format “EasyVision RAD 4.2 .....”

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Table 8-8: Computed Radiography Image Storage SOP Class - General Image Module

Attribute Name	*Tag*	*Note*
Image Type	0008,0008	
Acquisition Date	0008,0022	Always filled
Image Date	0008,0023	Always filled
Acquisition Time	0008,0032	Always filled
Image Time	0008,0033	Always filled
Acquisition Number	0020,0012	Always filled
Image Number	0020,0013	Always filled
Patient Orientation	0020,0020	
Image Comment	0020,0040	
Lossy Image Compression	0028,2110	

Table 8-9: Computed Radiography Image Storage SOP Class - Image Pixel Module

Attribute Name	*Tag*	*Note*
Samples per Pixel	0028,0002	Applied value(s): 1
Photometric Interpretation	0028,0004	Applied value(s): MONOCHROME2
Rows	0028,0010	Between 1576 and 5020
Columns	0028,0011	Between 1576 and 5020
Bits Allocated	0028,0100	Applied value(s): 16
Bits Stored	0028,0101	Applied value(s): 10
High Bit	0028,0102	Applied value(s): 9
Pixel Representation	0028,0103	Applied value(s): 0
Pixel Data	7FE0,0010	
Pixel Spacing	0028,0030	Extension on the standard. Contains pixel size in patient if image is calibrated. Contains pixel size in detector plane otherwise.

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Table 8-10: Computed Radiography Image Storage SOP Class - Contrast/Bolus Module

Attribute Name	*Tag*	*Note*
Contrast/Bolus Agent	0018,0010	Always empty

Table 8-11: Computed Radiography Image Storage SOP Class - CR Image Module

Attribute Name	*Tag*	*Note*
Plate ID	0018,1004	Empty if not entered by operator (always present for PCR)
Acquisition Device Processing Code	0018,1401	Contains a string describing the processing parameters and is generated by the system
Cassette Size	0018,1403	Always filled (always present for PCR)
Sensitivity	0018,6000	Always filled

Table 8-12: Computed Radiography Image Storage SOP Class - Overlay Plane Module

Attribute Name	*Tag*	*Note*
Overlay Rows	6000,0010	
Overlay Columns	6000,0011	
Overlay Description	6000,0022	
Overlay Type	6000,0040	Applied value(s): G, R
Overlay Origin	6000,0050	
Overlay Bits Allocated	6000,0100	
Overlay Bit Position	6000,0102	

Table 8-13: Computed Radiography Image Storage SOP Class - X-Ray Acquisition Module

Attribute Name	*Tag*	*Note*
Imager Pixel Spacing	0018,1164	Always filled

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Table 8-14: Computed Radiography Image Storage SOP Class - Display Shutter Module

Attribute Name	*Tag*	*Note*
Shutter Shape	0018,1600	Present if shutter is used Applied value(s): RECTANGULAR
Shutter Left Vertical Edge	0018,1602	Present if shutter is used
Shutter Right Vertical Edge	0018,1604	Present if shutter is used
Shutter Upper Horizontal Edge	0018,1606	Present if shutter is used
Shutter Lower Horizontal Edge	0018,1608	Present if shutter is used

Table 8-15: Computed Radiography Image Storage SOP Class - SOP Common Module

Attribute Name	*Tag*	*Note*
Specific Character Set	0008,0005	Applied value(s): ISO_IR 100
SOP Class UID	0008,0016	Applied value(s): 1.2.840.10008.5.1.4.1.1.1
SOP Instance UID	0008,0018	Created by EV

Table 8-16: Computed Radiography Image Storage SOP Class - Visit Status Module

Attribute Name	*Tag*	*Note*
Patient’s Institution Residence	0038,0400	If entered by operator or sent by RIS.

Table 8-17: Computed Radiography Image Storage SOP Class - EasyVision RAD Private Extensions Module [a]

Attribute Name	*Tag*	*Note*
Private Creator Group 0009	0009,00XX	VR=LO, VM=1 Possible values: ‘SPI-P Release 1’.
Image Data Consistency	0009,XX04	VR=LO, VM=n See also 3.1.2.2.3 on page 11.
Private Creator Group 0019	0019,00YY	VR=LO, VM=1 Possible values: ‘SPI-P Release 1’.
Original Pixel Data Quality	0019,YY25	VR=LO, VM=n See also 3.1.2.2.3 on page 11.

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Table 8-17: Computed Radiography Image Storage SOP Class - EasyVision RAD Private Extensions Module

Attribute Name	*Tag*	*Note*
Private Creator Group 0019	0019,00ZZ	VR=LO, VM=1 Possible values: 'SPI-P-PCR Release 2'.
Reader Mode	0019,ZZ10	VR=US, VM=1 Data Element indicating the mode used to read the image plates. Always filled with one of the enumerated values: 0: Automatic, 1: Semi-Automatic, 2: Fixed, 3: Manual (Automatic).
MRM Code	0019,ZZ20	VR=ST, VM=1 Data Element identifying the anatomical region and view via a code. Always filled.
Latitude	0019,ZZ40	VR=DS, VM=1 PCR Reader analyses the signal histogram while reading the image plate. The latitude describes the width of this histogram. So it is a PCR Reader parameter like Sensitivity. Always filled.
View Name	0019,ZZ60	VR=ST, VM=1 Free text Data Element to describe the patient position. Always filled.

a. This module is present if Private attributes are configured to be exported.

8.1 Basic Film Session SOP Class

Table 8-18: Basic Film Session SOP Class - N-CREATE

Attribute Name	*Tag*	*Note*
Number of Copies	2000,0010	Between 1 and 99.
Print Priority	2000,0020	Applied value(s): HIGH
Medium Type	2000,0030	Applied value(s): BLUE FILM, CLEAR FILM, PAPER
Film Destination	2000,0040	Applied value(s): MAGAZINE, PROCESSOR

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8.2 Basic Film Box SOP Class

Table 8-19: Basic Film Box SOP Class - N-CREATE

Attribute Name	*Tag*	*Note*
Image Display Format	2010,0010	The applied value below is an EasyVision specific value indicating that one (large) image is contained in a Film Box. Applied value(s): CUSTOM\1, STANDARD\1,1 (I is a vendor specific index, i.e.an integer) is applied if the Standard Image Display Format does not result in acceptable films. Purpose of this value is to use the film surface as much as possible for image printing (and avoid large margins). This should be agreed per printer vendor.
Film Orientation	2010,0040	Applied value(s): LANDSCAPE, PORTRAIT
Film Size ID	2010,0050	DICOM specifies a number of Defined Terms; more values are possible and is print configuration dependent.
Magnification Type	2010,0060	Normally sent out, however sometimes send out empty because some DICOM printers are not able to handle (value NONE for) this attribute. Applied value(s): NONE
Trim	2010,0140	
Configuration Information	2010,0150	Contains a vendor specific Lookup-table (LUT); should be applied by the DICOM printer if LUT data is present.

Table 8-20: Basic Film Box SOP Class - Basic Film Box Relationship Module

Attribute Name	*Tag*	*Note*
Referenced Film Session Sequence	2010,0500	Parent Film Session.
> Referenced SOP Class UID	0008,1150	
> Referenced SOP Instance UID	0008,1155	

Table 8-21: Basic Film Box SOP Class - N-ACTION

Attribute Name	*Tag*	*Note*
No attributes present		

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8.3 Basic Grayscale Image Box SOP Class

Table 8-22: Basic Grayscale Image Box SOP Class - N-SET

Attribute Name	*Tag*	*Note*
Image Position	2020,0010	Applied value(s): 1
Polarity	2020,0020	Applied value(s): NORMAL
Preformatted Grayscale Image Sequence	2020,0110	
> Samples per Pixel	0028,0002	Applied value(s): 1
> Photometric Interpretation	0028,0004	Applied value(s): MONOCHROME2
> Rows	0028,0010	Depending on the selected printer type and film size.
> Columns	0028,0011	Depending on the selected printer type and film size.
> Bits Allocated	0028,0100	Applied value(s): 16, 8
> Bits Stored	0028,0101	Applied value(s): 12, 8
> High Bit	0028,0102	Applied value(s): 11, 7
> Pixel Representation	0028,0103	Applied value(s): 0x0000
> Pixel Data	7FE0,0010	

8.4 Color Grayscale Image Box SOP Class

Table 8-23: Basic Color Image Box SOP Class - Image Box Pixel Presentation Module

Attribute Name	*Tag*	*Note*
Image Position	2020,0010	Applied value(s): 1
Polarity	2020,0020	Applied value(s): NORMAL
Preformatted Color Image Sequence	2020,0111	
> Samples per Pixel	0028,0002	Applied value(s): 3
> Photometric Interpretation	0028,0004	Applied value(s): RGB
> Planar Configuration	0028,0006	Applied value(s): 0000, 0001 0000, is not interleaved, 0001, frame interleaved.
> Rows	0028,0010	
> Columns	0028,0011	Depending on the selected printer type and film size.
> Bits Allocated	0028,0100	Applied value(s): 8
> Bits Stored	0028,0101	Applied value(s): 8

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Table 8-23: Basic Color Image Box SOP Class - Image Box Pixel Presentation Module (Continued)

Attribute Name	*Tag*	*Note*
> High Bit	0028,0102	Applied value(s): 7
> Pixel Representation	0028,0103	Applied value(s): 0000
> Pixel Data	7FE0,0010	

8.5 Printer SOP Class

Table 8-24: Printer SOP Class - N-GET

Attribute Name	*Tag*	*Note*
Printer Status	2110,0010	
Printer Status Info	2110,0020	

Table 8-25: Printer SOP Class - N-EVENT-REPORT

Attribute Name	*Tag*	*Note*
Printer Status Info	2110,0020	Conditionally sent by the Printer. EasyVision will ignore this status information. However, polling this status via the N-GET Service Element is done.

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